R.P. Note 79
Kathy Graden
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THE EFFECT SAFETY GLASSES HAVE ON REDUCING BETA DOSE TO THE LENS OF THE EYE TO WORKERS HANDLING DEPLETED URANIUM PLATES

Introduction

The purpose of this R.P. Note is to provide an estimate of the effect safety glasses have on reducing beta dose to the lens of the eye to workers who handle depleted uranium plates. It is current practice for workers to wear safety glasses when handling these plates. The experiment conducted provides an estimate of the relative reduction in beta dose to the lens of the eye as a result of the shielding provided by safety glasses.

Experimental Method

To provide the beta source, a set of three depleted uranium plates were used. These plates are approximately 3 inches by 3 inches and approximately 1/8 inch thick. The approximate distance between workers' eyes and the depleted uranium plates is twenty-four inches. In order to account for the attenuation of beta radiation through this distance in air, polyethylene was placed between the depleted uranium plates and the dosimeters. Polyethylene was used because it has a density close to that of air (0.92-0.95 gm/cm^3). By calculation, it was found that 0.078 cm of polyethylene attenuates beta radiation equally to that of a distance of 24 inches in air. Thirty-two mills of polyethylene radioactive waste bags were cut to the appropriate size to cover the plates.

To mimic the shielding effects of the safety glasses, three 1/8 inch Plexiglas plates were placed over a portion of the uranium plates. A thickness of 1/8 inch was chosen because the lenses of standard safety glasses are approximately 1/8 inch thick. Additionally, one pair of safety glasses were placed over a depleted uranium plate.

To measure dose from the depleted uranium plates, both TLD's and film badges were utilized. The film badges were Landauer P1 type test badges. Six TLD 700's and six film badges were placed on each uranium plate.

Three TLD's and three film badges were exposed to the uranium without shielding and the other set of three TLD's and film badges were placed on the Plexiglas plate. Additionally, one film badge was placed on a lens of the safety glasses. The TLD's and film badges were exposed to the depleted uranium for a period of 24 hours.

Results

The table below shows the TLD and film badge results:

Unshielded Dose			Shielded Dose		
	Film (mrem)	TLD (mrad)	Film (mrem)		TLD (mrad)
Beta	Beta & Gamma		Beta	Beta & Gamma	
2160	2270	3340	170	260	340
2110	2220	3570	150	240	280
1410	1540	3040	160	250	320
2210	2320	3910	160	250	320
2090	2210	2570	180	280	330
2060	2190	4420	180	280	350
2160	2280	2730	120	220	320
2270	2400	2870	170	270	290
2490	2610	2720	170	270	300

SAFETY GLASSES

Beta	Beta & Gamma
180	290

The average unshielded and shielded doses are shown below:

Average Unshielded Dose			Average Shielded Dose		
	Film (mrem)	TLD (mrad)	Film (mrem)		TLD (mrad)
Beta	Beta & Gamma		Beta	Beta & Gamma	
2110	2230	3240	160	260	320

Percent dose reduction due to Plexiglas shield is as follows:

Film (Beta only):	92.4%
Film (Beta & Gamma):	88.3%
TLD:	90.1%
AVERAGE REDUCTION:	90.3%

Conclusion

The data collected in this study indicates that the 1/8 inch Plexiglas shield reduces the beta dose to the film badges and TLD's by approximately 90%. Therefore, it appears that the practice of wearing safety glasses while handling depleted uranium plates provides a sufficient beta shield to the lens of the eye. If practical, further data could be collected by attaching two

TLD's to workers' safety glasses. One TLD could be placed on the outer lens and the other on the inner glasses lens for a specified period of time. This data would provide a beta dose reduction estimate due to the shielding effects of the safety glasses under normal depleted uranium handling conditions.